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ON THE SHEDDING OF THE CLAWS IN THE PTARMIGAN AND ALLIED BIRDS.

BY LEONHARD STEJNEGER.

THE fact of the ptarmigans shedding their claws regularly every summer, seems not to have been observed personally by any of the many excellent American ornithologists, and has, therefore, been comparatively little known to them. It may consequently not be without interest to demonstrate this process, as I have material at hand which shows the procedure very plainly.

The late Professor Sven Nilsson, the famous Swedish zoölogist, was the first to discover this peculiarity in the ptarmigans. His countryman, Professor W. Meves, afterward confirmed his observations, and at the same time proved that this singular shedding of the claws also occurs in other birds of the family Tetraonidæ, as, for instance, in both sexes of *Bonasa bonasia*, *Urogallus urogallus*, and also, in the female at least, of *Lyrurus tetrix*.

As will be seen in the specimens of the *Lagopus ridgwayi* (a new species which I was fortunate enough to detect on the Commander islands, near Kamtschatka), shot in June and August, before shedding, the middle claw measures 18-20$^{\mathrm{mm}}$, while in the specimen shot on the 23d of August, and which has just thrown the old ones off, the length of the new claw is only 11$^{\mathrm{mm}}$. More instructive still is a male, shot on the same day, as it has the claws only partially shed. The old claws have become loosened from their base and are forced 2-3$^{\mathrm{mm}}$ out, still covering the tip of the new ones, except on two toes, from which they have already dropped off. Hence it is obvious that the process is not a pathological one, in which the nail drops off as soon as it is perfectly separate from its bed, and has ceased to receive nourishment through the blood-vessels.

Most conclusive however, is a specimen of a quite different species, *Lagopus alba*, a specimen collected by Dr. Bean, on Unga, one of the Shumagin islands, Alaska. About this specimen Dr. Bean remarks in his "Notes on Birds collected in Alaska," etc., in the Proc. U. S. Nat. Mus., 1882, p. 163, as follows: "This specimen (shot on July 21st) corresponds very closely in most respects with number 33,548, a female from Norway, collected July 2,

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1862; the claws, however, are considerably shorter than in the Norway example, and in all other specimens of *albus* in the Museum." Dr. Bean was kind enough to show me the specimen, when it was apparent that the extreme shortness of the claws was due to the fact that the bird had shed them just before it was shot, except on the right outer toe, on which the nail was so loose, however, that it dropped off, as I was a little too rough in handling it.

It will thus be seen that the shedding takes place in July or August, according to locality and other circumstances, at the time when the toes are most denuded—in fact almost wholly naked—and the dark summer plumage is most complete. The claws grow very rapidly, however, and reach their full length long before the white winter-plumage with the densely clothed toes is fully developed.

So far as known, this process is confined to the members of the family of Tetraonidæ, mentioned above, when in the wild state, but Collett, in Christiania, has mentioned a case where a quail (*Coturnix coturnix*) shed its claws in confinement, but this may have been due to some pathologic process.

I am not aware that this peculiarity has been observed in any of the American Tetraonidæ, except *Lagopus alba*, but there seems to be no reason why it should not occur, at least in species living under conditions similar to those in Northern Europe, and Northeastern Asia. It is to be expected that we will soon hear of instances from this Nearctic region also, when attention has once been directed to it.

No histological investigation has been made to ascertain the causes and the development of this unusual process (at least I am not aware that any results of such an investigation have ever been published), and consequently nothing is definitely known.

As to the use which the birds derive from this extraordinary elongation of the claws, I shall only quote Professor Meves. He wrote in 1871[1] as follows: "They (Lagopus and Tetrao) have, all through the winter, to struggle with the snow upon which they are forced to walk. The snow is often loose, and with a foot like that of the common fowl, they would need much greater exertion of their strength in order to keep themselves on the surface. But as the ptarmigan by having the underside of the toes thickly coated with feathers, which can be spread out, and by means of the long and straight claws—which may be compared with snowshoes—are enabled to run easily over the snow, the usefulness and the necessity of the lengthening of the nails is self-evident. In the genus Tetrao (=Urogallus+Lyrurus+Bonasa) the lateral horny fringes of the toes render the same excellent service, and may fitly be regarded as a kind of snowshoes. *During the summer this whole outfit becomes superfluous*, which may be the main cause of the periodical shedding." It may in this connection be mentioned, that the horny fringes in Tetraones, and the thick feathering of the toes in Lagopodes also moult during the summer, at which time the toes of the latter are almost wholly denuded of feathers.

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[1] Öfr. Sv. Vet. Acad. Förhandl., 1871, p. 772.

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ON THE CONSTITUTION OF SOME APPENDAGES OF THE MOLLUSCA.

BY W. H. DALL.

IT is comparatively recently that the organic chemists have devoted any time to the investigation of the constitution of invertebrate organs or appendages, especially among brachiopods and mollusks. In the rare cases in which this has been done the observations in many cases were overlooked by the biologists most interested, and the occurrence of phosphate of lime in the shells of certain brachiopods is almost a singular instance where the statement of such a fact has penetrated all the manuals and text-books.

The teeth and radula of mollusks, an apparatus extremely characteristic of several classes of that sub-kingdom, and upon which classification has been largely based for at least thirty years, are commonly referred to in the text-books as "silicious," or "horny." The jaw, which is developed in nearly all of them, is referred to in the latest general work on the Mollusks (Encyclopædia Britannica, Art. *Mollusca*, p. 641), by Professor E. Ray Lankester in the following terms: "We find almost universally present in the Glossophora a pair of horny jaws (usually calcified) developed as cuticular productions upon the epidermis of the lips." The same author refers to the radula as "a chitinous band beset with minute teeth," "a horny cuticular product," and a "horny radula or lingual ribbon."